Significant progress has been made in the study of fluorescent label tracing of enveloped viruses where Wuhan virus is located

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Recently, a research team led by Wang Hanzhong, Wuhan Institute of Virology, Chinese Academy of Sciences, has made important research progress in nanomaterial-labeled enveloped virus tracing. Related articles were published in the American Chemical Society journal ACS nano.

The study of virus infection mechanism is one of the most basic and important issues in virology research. Single particle live virus labeling and tracing technology provides a more effective method and way for the study of virus infection mechanism. By labeling small fluorescent molecules on virus components to "go with the virus", it is possible to understand the fate of a single virus particle during the entire infection process, providing more intuitive experimental data for studying the virus's invasion mechanism.

Quantum dots are a new type of nanocrystalline fluorescent material. Compared with common organic dyes and fluorescent proteins, quantum dots have the advantages of strong optical stability, high fluorescence intensity, broad excitation and narrow emission, and have been used in the study of fluorescent labeling and single particle tracing of a variety of viruses. However, the existing methods have many defects, which limit the application of quantum dots in single-particle tracing of viruses, especially in the research of enveloped viruses. Since the enveloped virus needs to obtain the envelope inside the cell or when it exits the cell, the existing labeling methods are to mark the envelope of the virus with quantum dots. The envelope of the enveloped virus is involved in many necessary links for effective infection such as receptor binding and membrane fusion, and surface labeling of it may affect the infectivity of the virus. The interaction between quantum dots and the cellular environment may also change the way the virus infects. In addition, as the viral membrane fusion process occurs, the quantum dots also fall off, making it impossible to achieve long-term tracking.

The Wuhan Institute of Virology, Zoonoses, uses quantum dot-DNA probes to specifically label the genomic RNA of HIV lentivirus. As the packaging signal on the genomic RNA interacts with the viral capsid protein, the quantum dots are also packaged inside the virus particle. Studies have confirmed that this quantum dot packaging strategy has almost no effect on the efficiency of virus entry, and can be used for labeling and tracking of enveloped viruses. Moreover, since quantum dots still exist in the viral capsid after membrane fusion, they have potential advantages in tracking the late stage of viral membrane fusion. The establishment of this method is expected to promote the application of virological research in nanomaterials and the research of enveloped virus infection mechanism.

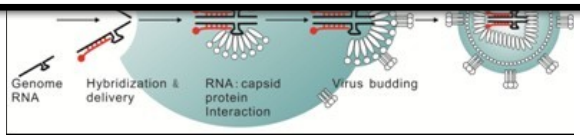

Figure 1: Envelope virus packaging quantum dot strategy

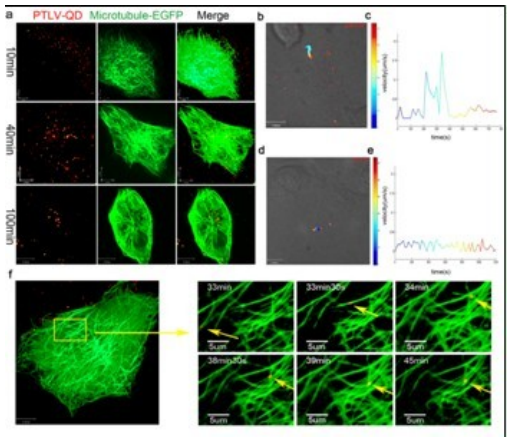

Figure 2: Pseudovirus single particle trace of packaging quantum dots

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